2. CONTRIBUTED PAPERS

2.1. Branching processes and population models

On the Growth of the Multitype Supercritical Branching Process in a Random Environment

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Let $\{Z_n\}$ be a Athreya–Karlin multitype branching process in a random environment. If the environmental distributions have first and second order moments bounded away from ∞, then norming the $\{Z_n\}$'s components by the expectations yields a L^2-convergent process. The proof is based on a martingale-subsequence approach which reduces the study to the properties of i.i.d. random variables. The Furstenberg–Kesten a.s. convergence theorem for random matrices yields stochastic compacticity. Unlike the Galton–Watson case the notion of eigenvalue does not appear in our arguments.

Limit Fluctuations of a Critical Branching Particle System in a Random Medium

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We consider a particle system in R^d where the particles are subject to spatial motion according to a symmetric stable law and to a critical branching law in the domain of attraction of a stable law. The branching intensity is given by a realization of an ergodic random medium. We show that under natural assumptions the limit fluctuations of the appropriately scaled system around the macroscopic flow are the same as those given by the averaged medium. The (hydrodynamic) limit fluctuations process is an $\mathscr{S}'(R^d)$-valued Ornstein–Uhlenbeck process. The Langevin equation for this process is of the form

$$\mathrm{d}Y_t = -(-\Delta)^{\alpha/2} Y_t \,\mathrm{d}t + \mathrm{d}Z_t,$$

where Z is an $\mathscr{S}'(R^d)$-valued process with independent increments which are distributed according to an asymmetric stable law. The convergence proof involves an analysis of a nonlinear integral equation with random coefficients.